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*Billings, J. S.*

# Methods of Teaching Surgery.

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## METHODS OF TEACHING SURGERY.<sup>1</sup>

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THIS paper has been prepared at the request of the Committee on Programme, to serve as an introduction to a discussion upon the best methods of teaching surgery, and is intended to ask questions rather than to answer them. We have to consider: (1) Who are to be taught? (2) What is to be taught? (3) How it is to be taught.

Those who are to be taught include two classes: (1) The average medical student, who is presumably to become a general practitioner; (2) The men who wish to specially fit themselves for surgical work. There is a third class, namely, those who wish to learn only the least possible amount of surgery which will enable them to get the degree of M.D., but these we need not consider to-day.

The surgical instruction to be given the average student depends on what he is required to know of anatomy and pathology before he begins his surgical studies, upon the amount of time which is allowed for surgical instruction, and upon the nature of the final examination which he must pass to obtain his degree, or license to practice.

In any case it should include the diagnosis, and best method of treatment, of the injuries and surgical diseases which the general practitioner is most often called upon to treat, including recent wounds and their complications, erysipelas, abscess, ulcers, etc.; fractures and dislocations, injuries of blood-vessels, strangulated hernia, urethral stricture, retention of urine and its

<sup>1</sup> Paper read before the American Surgical Association at Washington, Wednesday, May 30, 1894.

consequences ; obstruction of, or foreign bodies in, the air passages ; and also the selection and administration of anaesthetics, the details of aseptic and antiseptic methods, and of methods of performing the most usual amputations and ligations of blood-vessels.

Let us suppose that the instruction is to be given in a three-years' graded course ; what other subjects besides those above mentioned ought to be fully treated of by the surgical teacher ? Under such circumstances is it worth while to go into the details of cerebral and abdominal surgery, of lithotomy and lithotrity, of excisions of organs or of the jaws and joints, of plastic and orthopædic surgery ? Is it not enough to tell the average student what can be done in these directions, and refer him to special courses or to current literature for further information with regard to complicated and difficult operations requiring special instruments and apparatus ? Of course, it is to be practically demonstrated that the teacher is the proper person to whom cases of this kind should be sent.

Deferring for a moment the consideration of the needs of the man who wishes to become a surgeon, we come to the question, " How are these subjects to be taught ? " There are five principal methods : (1) Didactic systematic lectures ; (2) recitations ; (3) demonstrations and practical instruction by means of manikins, dummies, cadavers, and operations on animals, in the details of treatment of wounds, bandaging, dressings and operations ; (4) theoretical clinical lectures, in which cases and operations are shown in an amphitheatre ; (5) practical clinical instruction to small groups of students or ward classes, in which, as far as possible, each student has something to do in the diagnosis or treatment, or both.

The modern tendency is to reduce the time given to systematic lectures. In discussing the wisdom of this,

we must bear in mind the different organization of the teaching staff in different schools, the increasing number of chairs or lectureships devoted to specialties, and the fact that the precise division of subjects among the instructors in a given school must depend to a considerable extent on local conditions, on the character, tastes and teaching-powers of the different men who make up the faculty, on the amount and character of the facilities for laboratory and clinical teaching present, etc.

In the old-fashioned type of medical school, in which the whole instruction was given by seven or eight men, the professor of surgery taught what was called surgical pathology, or the principles of surgery, gave considerable attention to surgical anatomy, and was the clinical as well as the systematic teacher. There was at least one advantage, namely, that the teaching was consistent and harmonious; the student was not much bewildered with the conflicting views of different professors. The professor of anatomy was in training for the chair of surgery and took very little interest in comparative anatomy or in embryology. There was no professor of pathology; and both the professor of surgery and of medicine lectured on inflammation, congestion, suppuration, etc., each from his own point of view.

At present, in a large and popular medical school, there are from twenty to thirty teachers of various grades; there is a professor of pathology, of surgery, of clinical surgery, of surgical anatomy, of orthopædic surgery, of genito-urinary surgery, etc., and the professor of gynaecology takes a large share of the abdominal surgery.

Now how can the subject of surgery be subdivided among all these teachers in such a way that the whole field shall be covered, without involving useless repetitions, embarrassing contradictions, and the expenditure

of an undue amount of time and labor by the student, or of the production of heart-burnings in some of the teachers? This is one of the most difficult problems in the organization of a large medical school which is to be really efficient and popular, and it is one to which no general and universal formula is applicable.

Theoretically, each professor being a thoroughly wise, unselfish, good-tempered man, desiring only the best interests of his pupils and of his school, and there being frequent consultations between them to secure harmony in their teachings, the desired result may be obtained. Practically, there are usually two or three strong men in the faculty who settle what shall be done, and the rest find it expedient to submit, although they may not agree. When there are no sufficiently strong men, and all the professors are not perfectly good and unselfish, there may be trouble.

Let us consider details a little. A well organized medical school should have a professor of pathology and pathological anatomy, under whose direction a certain amount of laboratory instruction should be given — comparatively simple for the average student, extended and elaborate for post-graduates. The greater part of his teaching for the average undergraduate student must be by lectures, with demonstrations.

Given such a teacher, with the necessary facilities, why should the professor of surgery lecture on surgical pathology or bacteriology to the average undergraduate? The only really good reason I think of is, that he should be thoroughly familiar with the subject, and at times use experimental methods in devising improvements in surgical practice, and that teaching the subject greatly helps him to obtain, classify and retain his knowledge. But his teaching on this subject would be most valuable to a special class of advanced stu-

dents, or post-graduates — who can devote themselves to it, and give the necessary time to that experimental work on animals which is absolutely essential to secure satisfactory results.

At all events, I think we can agree that the relations between the surgeon and the pathologist should be intimate and friendly, while each should be entirely independent of the other, and that the surgeon should go into details of practical application of principles in accordance with the more general teaching of the pathologist.

As regards the teaching of surgical anatomy, and of operations on the cadavér, by a teacher distinct from, and entirely independent of, the professor of anatomy on the one hand and the professor of surgery on the other, I believe that there are widely different opinions as to its expediency. Such an independent chair, or demonstratorship, is usually provided to make a place for some particular man, and its utility must depend upon who this man is.

While no general rule on this point can be laid down, might it not be best that attendance on such an independent course should be purely voluntary on the part of the class, and that it should be largely devoted to the instruction of those who wish to make a specialty of surgery? It appears to me that more use should be made of living animals than is now done, in teaching the results and treatment of wounds, including details of aseptics and antiseptics, and in special courses for advanced students who should be required to perform operations under the guidance of the surgeon.

The next question is as to the part which clinical surgery should play in a course of education leading to a medical degree. The great majority of students prefer clinical teaching and demonstrations to didactic lectures, and will go where this clinical teaching is

most brilliant and varied ; and, so far as it goes, we must admit that this kind of teaching is generally the most useful to them, because they remember it better. How far is it possible to cover the field of diagnosis and treatment of injuries and surgical diseases by clinical teaching alone to the extent that is desirable for the average medical student ? And how far is it desirable to vary and modify the didactic teaching so as to make it supplementary to the clinical teaching ?

Evidently the answers to these questions must depend in part upon the amount and variety of clinical material that is available, and hence must differ for different schools. As a rule, clinical material is not available to cover the entire field for any school, no matter how large its hospital and dispensaries — hence there must be some systematic didactic teaching. Is it best that this should be a complete independent course covering the whole field, merely using for any particular subject such cases as may happen on that day to be available, thus leaving the greater part of the clinical teaching to duplicate that which has been given in the systematic course ? This is, upon the whole, the easiest way, and in favor of it is urged that it is desirable that the student should be told the same thing several times to ensure his remembering it. This is the argument which used to be used in favor of the old plan of not having a graded course but compelling the students to listen to the same course of lectures in successive years.

On the other hand, it can be seen that there would be certain advantages in deferring the systematic lectures until towards the end of the course, and then devoting them mainly to subjects which had not been illustrated in previous clinical teaching ; but to make this plan a success it would be necessary that the systematic lecturer should either have given all the clinical

instruction, or should be perfectly familiar with all that has been given.

A possible modification of this plan would be to let two professors divide the field of work, each taking a certain class of diseases and injuries, giving clinical instruction thereon and supplementing it with systematic teaching as above suggested, and then the two men exchanging fields of work each year. An objection to this is that a considerable part of clinical teaching is given in connection with patients who select their own surgeon, and who will not make such selection with reference to any curriculum. Undoubtedly the more clinical instruction of the right kind that can be given, the better for the students, and for the reputation and prosperity of the school.

But this phrase "clinical instruction of the right kind" brings up a new set of questions. How much does it profit the student to witness, from the rear benches of an amphitheatre, such operations as the ligation of arteries, the extirpation of tumors, lithotomy or nephrectomy? Undoubtedly the student is interested and learns something, and he will go where he can see—if not the operation itself, at least the heads of the persons who are busy about the patient; and it will not do to restrict his privileges much in this respect. At the same time, should not special opportunities be given to the few who are devoting themselves specially to surgery to see as much as possible of difficult and unusual operations? It appears to me that more than two hundred men cannot possibly obtain any special information from surgical clinics in an amphitheatre which they could not obtain equally well in a didactic lecture, and which could not be much better given with illustrations by means of lantern slides, than by using a patient as a means of demonstrating an operation. It is quite possible to show by

means of lantern slides, as Dr. Kelly has proved, to several hundred men, every detail of an operation which can be seen by the immediate assistants of the operator.

Now with regard to clinical teaching to comparatively small sections, or ward classes, the members of which are to be brought as much as possible into contact with the patient, and even to assist in the operation of dressing. There is no doubt as to the utility and popularity of this mode of teaching, but in this connection a word may be said with regard to the relations of hospitals and dispensaries to surgical teaching.

While I believe that a hospital is not doing its fullest and best work if it is not increasing and diffusing knowledge, and that patients secure the best and most careful attention and treatment in teaching-hospitals, where the work of the staff is keenly scrutinized, yet it must be admitted that there is sometimes a danger that people will get the idea that in a teaching-hospital the interests of the patients are not as fully consulted as they should be, and will avoid that hospital as much as possible. This danger arises mainly from two things: first, the allowing students to have anything to do with the treatment, and especially with an operation. The patient wants to be operated on by the most skilled man, that is, by the professor; and if he has a suspicion that after he is under the influence of an anæsthetic the professor may hand the knife to a student to make perhaps his first essay, he will avoid that place. All of us would do the same, and therefore in ward-class teaching a patient should never be deceived as to who is to perform the operation, for sooner or later the deception will be discovered and the news will spread.

The second danger to the popularity of a teaching-hospital is that patients are not unfrequently made to

wait until their cases can be used for clinical instruction, sometimes for hours, sometimes for days. In most cases the patient knows when he is to be put off for this purpose, and after one experience of the kind he will go to another hospital the next time and advise his friends to do the same.

It is well also that the clinical surgical teacher should remember that his ability to obtain abundant clinical material depends to a very considerable extent upon the manners and on the good-will of some of his assistants, the resident physician, the nurses, etc., who are often the first to see the patient as an applicant, and who have much to do with subsequent treatment.

These assistants, residents, receiving-officers, case-takers and nurses, are not always possessed of the exquisite tact, kindly sympathy, and knowledge of human nature which it is to be presumed are invariably the characteristics of the clinical surgeon; and it is a part of his business to instruct them and perfect their manners as much as possible.

Recitations and quizzes are excellent methods of teaching for the majority of students, but are only well adapted to small classes or sections. At present they are, for the most part, conducted as a private enterprise by persons who may, or may not, be on the teaching staff. The question as to whether this mode of teaching should be made use of in the official course to a considerably greater extent than is now done is an interesting one and is commended for discussion. It appears to me more desirable that it should be applied to the clinical teaching than to the didactic lectures, and one good result of this would be to discourage the reliance on quiz compends, which I think invariably do more harm than good.

With regard to modes of lecturing, every man is, of course, a law unto himself; yet I will venture one or

two suggestions. The teaching for a class of students should be definite, selective, and, to a considerable extent, dogmatic; and critical historical discussions should be used very sparingly.

What the student hears and sees during the first half-hour of a lecture is what he will remember best, and will have the best notes of; therefore, when there are several different ways of doing a thing, let the teacher describe first the method which he prefers, taking all the time required to fully demonstrate it and impress it on the student. After that is done the other methods may be referred to and so much history and criticism given as time will permit. If the reasoning is given before the conclusions are stated, the student is apt to get confused, and to characterize the teacher as a "wobbler."

If the lecturer will fix in his mind the half-dozen questions or so that he would ask to test the students' knowledge of the subject upon which he is going to speak, and will then make it his main object to answer those questions clearly, definitely and fully, he can hardly fail to give a good lecture.

In objecting to too much history in didactic or clinical lectures on surgery, I do not wish to be understood as underestimating the importance of giving historical instruction. I think that in every medical school a course of lectures on the history of medicine and surgery, combined with practical instruction in bibliographical methods, should be given; and if this is not done, then I would advise that the professor of surgery devote five or six lectures to the history and literature of his subject, which lectures will probably be most useful and interesting at the beginning of the last year of the student's course.

It was stated at the beginning of this paper that besides the average medical students, the needs of the

man who wishes to specially fit himself to be a surgeon should be considered. These relate to post-graduate work mainly, for a broad foundation of medical knowledge is requisite for the man who wishes to become a surgeon. The technique of operative surgery, important as it is, is secondary in importance to skill in diagnosis, and to knowledge of therapeutical methods which do not involve the use of the knife.

The man who intends to be a surgeon should not only make a special study of surgical anatomy, but should do a considerable amount of practical laboratory work in bacteriology, pathological histology and experimental pathology and physiology.

It is quite true that the majority of our leading surgeons could not perhaps, by themselves, make a bacteriological diagnosis, or determine fine distinctions in new growths, and yet they do good work — having these points settled for them by younger men trained in the new methods. But the surgeon of the future should himself be trained in these methods, even though he may employ others to carry them out.

And in this connection I would remind you that bacteriology cannot be profitably studied for two or three days in a week, but that it needs at least three hours a day every day for three months for a man to learn how to begin readily to use its methods. In general, I think that all studies are best concentrated, and that the usual plan of dividing studies into an hour two days a week for this, and an hour three days a week for that, etc., is much more for the convenience of the professors than it is for the true interest of the students.

As for operating technique, much of it can be learned on animals, but much of it requires also work on the cadaver, the repetition over and over again, until, as Billroth said, a man could do it when he was asleep.

The most important of all is residence in a hospital, the working as assistant to a surgeon, the seeing and handling cases, and not merely looking at them from a distance. The number of men who are able and willing to carry out such a course of study as that indicated is limited, and the teacher of surgery cannot do very much for them except give them opportunities for seeing his methods and results; but is it not possible to give them better opportunities than can be provided for a large class of undergraduates? Should they not be required to repeatedly perform the many operations which can be advantageously performed on animals before they try these operations on man? It seems to me that in the last year of a four-years' course all students should be tested in this way; but it must be admitted that, with the present curriculum, there is not time to spare for this purpose, especially where the graduating class is a large one.

This leads to two final questions, which, though not directly connected with "the best methods of teaching surgery," have nevertheless, an important bearing on it. The first is: Are there not some subjects which occupy too much space in the undergraduate curriculum of our largest and best medical schools, such for example, as inorganic chemistry, and embryology? Ought not the student to be required to know so much as is required of inorganic chemistry before he begins his medical course? Is it desirable to make embryology and general morphology a part of the curriculum for all medical students, as a basis for the study of anatomy, or is it wiser to place these as elective studies in a post-graduate course, and to insist on more dissecting and a greater knowledge of practical anatomy than is now generally demanded? In this connection your attention is invited to the widely different opinions as to the best methods of anatomical teaching — as rep-

resented by Professor Macalister for the morphologists, and Mr. T. Cooke for the old school, which have appeared in the *Lancet* and in the *British Medical Journal* during the past year.

It appears to me that the teaching of anatomy should begin with a few lectures and demonstrations on general morphology, and that the first dissections should be made on cats and dogs until a good technique has been acquired, so that the supply of human cadavers, which is always insufficient, can be fully utilized to the best advantage. I also think that it is unwise to have the final examination in anatomy one or two years before the other final examinations ; the anatomy should be kept up throughout.

My last question is : Would it not be good policy for a first-class popular medical school to limit the number of pupils which it will accept to its capacity to give them proper instruction in laboratory work, in practical anatomy, and in clinical medicine and surgery ? Of course, each faculty is prepared to assert that its own school now does this, and will disapprove of fixing any limit to the number of its pupils ; nevertheless, it appears to me, as an outsider, that there are at least two or three medical schools in this country which would act wisely if they would fix a limit to the number of students which they would receive either in the first or in the third year, or in both, and enforce this limit by competitive examination or by higher fees, or by both. It would bring the best men to them, and would enable them to do thoroughly good work.







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